

New infrastructure in China

What, why, how and where

New infrastructure has become one of the major initiatives to boost China's economic recovery from COVID-19. Broadly defined, new infrastructure will not only facilitate digitization of the whole economy, but also improve people's well-being. New infrastructure also distinguishes itself from previous boosts in terms of 1) higher multiplier effect; 2) more active private sector participation; and 3) stimulating consumption as well as production.

New infrastructure is critical for driving incremental growth of infrastructure FAI. We estimate that 39% of Guangdong's key infrastructure investment in 2020 and a quarter of local government special bond issued nationwide in Jan-Feb 2020 is designated for new infrastructure projects. Despite construction delays in 1Q20, we forecast infrastructure FAI to maintain stable at 3.5-4.5% YoY in 2020 (vs. 3.8% in 2019) on back of new drivers and policy support.

Infrastructure investment is a long-term endeavor. Decision making should be market-oriented to ponder risk/return, financial performance and leverage positions as well as executive orders. Policy boost should not come at the cost of taking excessive risks and about that, China has already learned painful lessons in the previous stimulus cycle.

- **What is "new infrastructure"? We define new infrastructure in a broad sense**, which contains two major categories. 1) Technology infrastructure, which promotes technology deployment. Examples include 5G, data centers, AI, Industrial Internet, EV charging points, etc. 2) Extensions of traditional infrastructure, which enhance weak links of existing infrastructure facilities and improve people's well-being. Examples include inter-city and urban rail transit, ultra-high voltage electricity transmission, parking lots, cold-chain logistics, etc.
- **Why we turn to new infrastructure?** The fact that traditional infrastructure investment is losing growth momentum is one of the reasons for chasing new targets. But more importantly, **evolution sprouts new demand**. Global technology development necessitates the establishment of new IT infrastructure, represented by 5G, data centers, AI, block chain, etc. Bigger cities and regional integration call for mass transit tools like inter-city railway. As economy develops, cities also need parking lots, EV charging pots, logistics facilities, etc.
- **How different is it from previous infrastructure boost?**
 - 1) **Boost consumption as well as investment.** Unlike traditional infrastructure facilities which may take years to pay off, technology infrastructure can drive consumption as well as output growth in a speedier way. With 5G and IoT deployment, output of cellphones, ICs, industrial robots and even downstream sales of these products have been trending up since 2H19.
 - 2) **Deeper participation of the private sector.** Instead of governments playing decisive roles, new infrastructure projects actively involve private players so that decision making and execution is more likely to follow a market-oriented procedure, which examines risks/return profile, financial feasibilities, and leverage positions as well as government endorsement.

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- 3) **Promote technology diffusion and adoption.** For example, the construction of publically available charging points will remove one of the major barriers for NEV adoption so as to achieve 25% NEV penetration by 2025.
- 4) **To give China a head start in the next wave of industrial revolution.** It is well acknowledged that 5G and data centers are critical information infrastructure to kick off digitization of manufacturing, services and all other value-creation processes.

■ **How large is the scale of new infrastructure?**

We need to admit that technology infrastructure is dwarfed in construction size by traditional infrastructure, such as railways and roads. But the multiplier effect is seminal. For example, 5G is estimated to incur RMB 1.2tn construction FAI by 2025 but is to trigger RMB 3.5tn investment along its supply chain, let alone investment in other remote industries and derived consumption demand.

In order to gauge the scale of new infrastructure (based on our broad definitions), we examined key **construction projects of Guangdong Province**. Among the planned RMB 441.2bn infrastructure investment in 2020, we found that RMB 174.2bn, or **39% is planned for “new infrastructure”** projects. These include IT infrastructure (RMB 17.2bn), intercity railways (RMB 10.9bn), offshore wind power (RMB 26.6bn), electricity transmission projects (RMB 42bn, including ultra-high voltage ones), and urban rail transits (RMB 62.7bn). Among the newly-launched projects in 2020, **87%** investment is designated for new infrastructure.

- **Where does money come from?** Funding environment for infrastructure projects is amiable. Channels include novel funding sources, such as local government special bonds (LGSBs) and PPP projects, as well as municipal bonds and bank loans. Of the RMB 949.8bn new LGSBs issued in Jan-Feb 2020, we estimate that 82% is planned for infrastructure projects and among this, **25%** is for new infrastructure. PPP projects are also viable choices particularly when the private sector involves in construction and maintenance of facilities. Total investment of PPP projects entering execution stage reached RMB 10tn at the end of Jan 2020, and we estimate roughly **24.4%** involves new infrastructure according to our broad definition.
- **How to avoid spending spree?** 1) Adopt market-oriented decision making, to comprehensively assess risk and return; and 2) encourage private sector participation in both construction and maintenance management of facilities to promote efficiency.
- **Outlook for infrastructure investment.** Major interruptions were caused by COVID-19 in 1Q20 and work resumption rate of the construction sector was barely 60%. We expect infrastructure FAI to post YoY decline of 1-2% in 1Q20 and gradually pick up in 2Q. Over the whole year, we forecast infrastructure FAI growth to maintain stable at 3.5-4.5% YoY (vs. 3.8% in 2019) on back of fresh drivers and all-rounded policy support.

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A short revisit of “traditional” infrastructure

Infrastructure investment boosted China’s economy during downturns

Infrastructure can be defined in various ways depending on circumstances and as time goes by. Normally, it refers to long-lived, capital-intensive facilities. In a narrow or traditional sense, infrastructure investment in China has been provided largely by the government. It mainly involves railways, roads, transport facilities, water conservancy, electricity supply and other public service facilities.

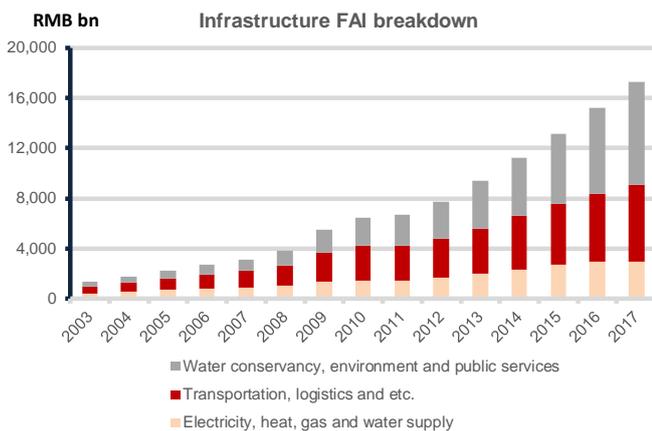
Transport facilities probably constitute one of the largest parts of infrastructure investment. Climbing nearly 50% in 2009 and 20% in 2013-14, transportation FAI was a critical contributor to help China’s economy achieve sustained growth against global headwinds. The high-speed railway and efficient highway networks stretching out today across the nation was primarily built intensively during that period.

However, traditional infrastructure investment is losing momentum

Infrastructure investment was the backbone of FAI during 2008-09, but its marginal contribution to FAI growth has been waning in recent years.

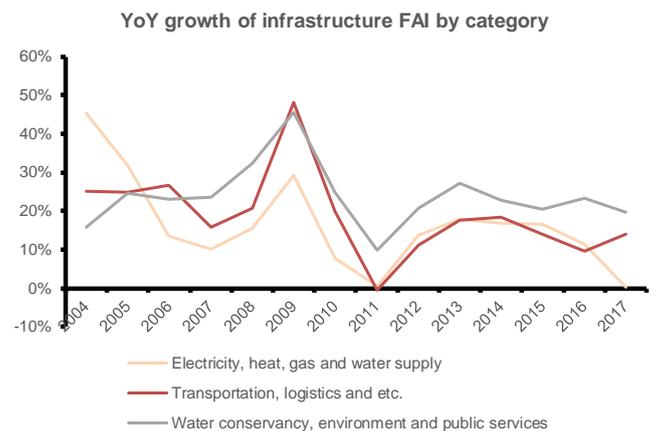
Railway construction FAI has been flat in the past five years at around RMB 800bn. Annual target of 2020 is set again at RMB 800bn. Road construction FAI posted 0.8%/1.3% YoY growth in 2018/19. We think one of the primary reasons for lackluster infrastructure investment is the scarcity of large, seminal and financially viable projects. Such scarcity could come as a result of 1) increasingly mature transportation network in China, which makes it less likely to enjoy another big leap forward; and 2) stricter project approvals, which attach more importance to investment return and risks.

Figure 1: Transportation facilities are one of the largest contributors to infrastructure FAI



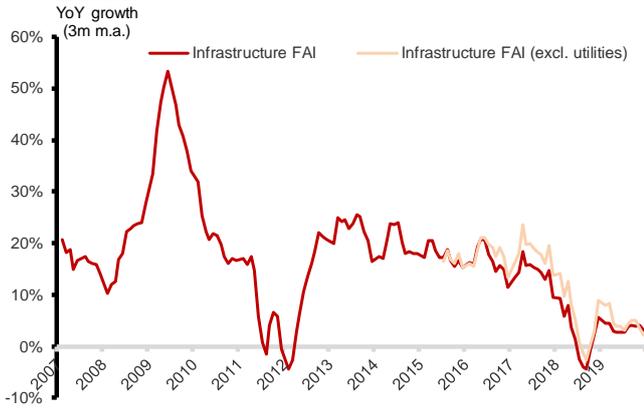
Source: NBS, Wind, CMBIS

Figure 2: ... and also drove infrastructure growth during the 2008-09 global financial crisis



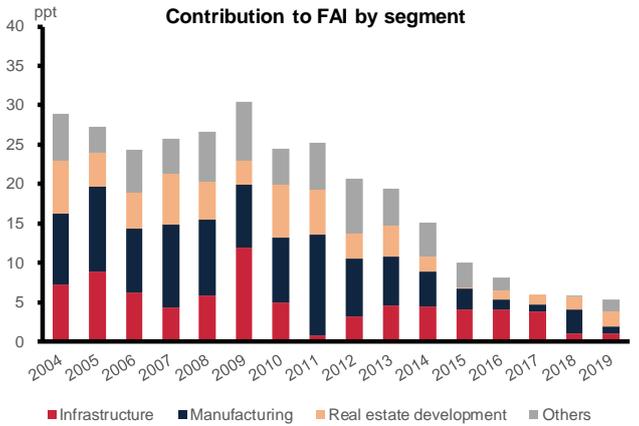
Source: NBS, Wind, CMBIS

Figure 3: Infrastructure FAI increased 3.8% YoY in 2019



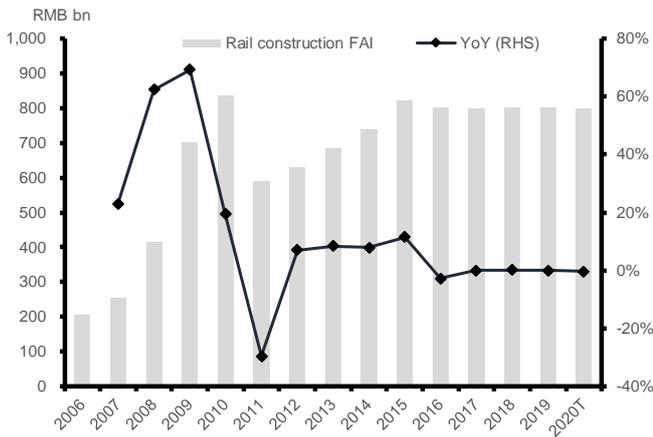
Source: NBS, Wind, CMBIS

Figure 4: Infrastructure served as the backbone of FAI in 2009, but its contribution is waning in recent years



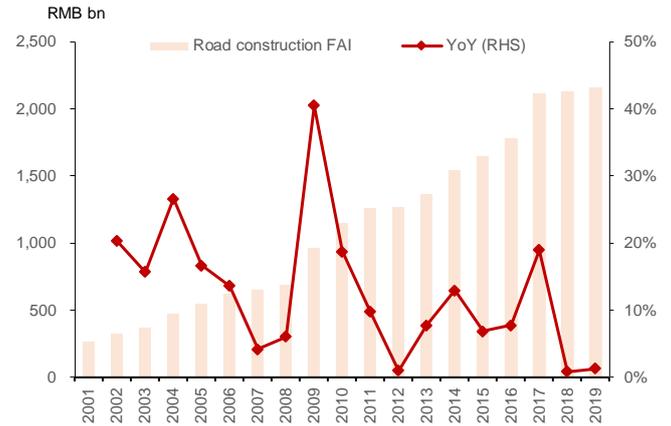
Source: NBS, Wind, CMBIS estimates

Figure 5: Rail construction FAI has been hovering around zero growth.



Source: NDRC, Wind, CMBIS
*2020T indicates 2020 annual target of rail construction FAI at RMB 800bn.

Figure 6: Road construction FAI increased 1.3% YoY in 2019



Source: NDRC, Wind, CMBIS

What is new infrastructure?

First brought up in Dec 2018; emphasized during COVID-19 combat

Lackluster traditional infrastructure investment calls for new drivers. The notion of “New infrastructure” was first officially brought up at the Central Economic Work Conference (CEWC) in Dec 2018. That meeting urged construction of new types of infrastructures, such as 5G, AI, Industrial Internet and Internet of Things (IoT). In the following meetings in 2019, technology and information infrastructure was mentioned frequently and in tandem with other infrastructure “weak links”, which need to be improved. In the recent COVID-19 combat, the Politburo Standing Committee endorsed 5G network and datacenter construction to underpin economic recovery.

Figure 7: A brief summary of top-level mentions about "new infrastructure"

Time	Conference/Meeting	Areas of infrastructure mentioned	Original text (in Chinese)
Dec-2018	Central Economic Work Conference	5G commercialization, AI, Industrial Internet, IoT; Intercity transport, logistics, urban infrastructure, rural infrastructure and public service facilities;	加快 5G 商用步伐, 加强人工智能、工业互联网、物联网等新型基础设施建设, 加大城际交通、物流、市政基础设施等投资力度, 补齐农村基础设施和公共服务设施建设短板;
Mar-2019	Government Work Report	Technology and information infrastructure; Intercity transport, logistics, urban infrastructure, disaster prevention, civil and general aviation;	加强重大科技基础设施、科技创新中心等建设; 加大城际交通、物流、市政、灾害防治、民用和通用航空等基础设施投资力度, 加强新一代信息基础设施建设;
Jul-2019	Politburo Meeting	Urban renewal, parking lots, cold-chain logistics; Information network infrastructure	实施城镇老旧小区改造、城市停车场、城乡冷链物流设施建设等补短板工程, 加快推进信息网络等新型基础设施建设;
Dec-2019	Central Economic Work Conference	To step up financing for weak links in infrastructure;	引导资金投入供需共同受益、具有乘数效应的先进制造、民生建设、基础设施短板等领域; 加强战略性、网络型基础设施建设;
Mar-2020	Politburo Standing Committee Meeting	5G network, data centers	加快 5G 网络、数据中心等新型基础设施建设进度

Source: News, CMBIS

Ad hoc definition of “new Infrastructure” is technology oriented

When first brought up, “new infrastructure” specifically referred to infrastructure projects that are oriented toward technology establishment, or “technology infrastructure”. According to CCTV news on 1 Mar 2019, new technology infrastructure encompasses seven areas – (1) 5G; (2) ultra-high voltage transmission; (3) intercity high-speed rail and regional rail transit; (4) electrical vehicle charging points; (5) data centers; (6) AI; (7) industrial internet. As the economy developed in the past year, we think the scope of technology infrastructure has been enriched so that it may also include Beidou navigation system, blockchain and other strategic networks that facilitate technology diffusion.

Figure 8: CCTV definition of “new infrastructure” (as of 1 Mar 2019)



Source: <http://tv.cctv.com/2019/03/01/VIDECViDIKqPqGkKvRMe7N42h190301.shtml>, CMBIS

We define “New Infrastructure” in a broader sense.

As tabulated in Figure 9 below, our definition of “New Infrastructure” is twofold. In practice, the two subgroups we identified below are sometimes interchangeable.

1) Technology infrastructure, such as 5G and data centers.

2) Extensions of traditional infrastructure.

These projects serve at least **dual purposes**. **a) Enhance weak links** of existing infrastructure investment. For example, intercity high-speed rail and urban rail are necessary when cities grow bigger and more crowded, calling for mass transport tools and regional integration becomes an inevitable trend. **b) Improve people’s well-being**, e.g. renovation of urban areas, construction of parking lots and cold-chain logistics.

Figure 9: We define “New Infrastructure” in a broader sense

New Infrastructure		
	Technology infrastructure	Extensions of traditional infrastructure
Content	5G Data centers AI Industrial Internet EV charging points Ultra-high voltage transmission Beidou Navigation system Blockchain ...	Intercity high-speed rail Urban rail transit Renovation of urban areas Parking lots Cold-chain logistics Waste disposals Industrial parks Renewable energy ...
Purpose and impact	- Boost not only investment but also consumption - Push for technology diffusion - Prepare China for the next Industrial Revolution	- Boost infrastructure investment - Promote regional integration - Improve weak links and people's well-being

Source: CMBIS

Why new infrastructure?

In addition to the fact that traditional infrastructure investment lacks growth momentum, we believe there are at least two more explanations for new infrastructure becoming the investment focus. 1) New infrastructure may have higher multiplier effect; and 2) there exists new unmet demand for new types of infrastructure.

Technology infrastructure investment carries high multiplier effect

The majority of infrastructure projects have multiplier effect, which means 1 input yield >1 economic output. Technology infrastructure could carry higher multiplier effect than traditional ones. Let's take 5G as example. According to CAICT, construction FAI of 5G will accumulate to RMB 1.2tn by 2025 and trigger RMB 3.5tn investment along its supply chain. That gives an investment multiplier of around 3. If we also consider numerous "5G + Industry" initiatives which encompass almost all life scenarios, then according to the MIIT, 1 unit investment in 5G construction is estimated to yield 6 units output for the economy, i.e. a multiplier of 6.

Economic development sprouts new demand for infrastructure

Despite making big strides in the past decade, China's infrastructure establishment needs to respond to continuously-evolving economic, demographic, and environmental situations if it is to help firms thrive, people live happily and the economy prosper. Urban and rural development sprouts new demand for infrastructure facilities. For example, expanding cities and regional integration plans call for urban and intercity rail transit. Electric vehicle adoption requires charging facilities. Parking lots are needed to park the increasing number of vehicles on road.

How does new infrastructure differ from previous ones?

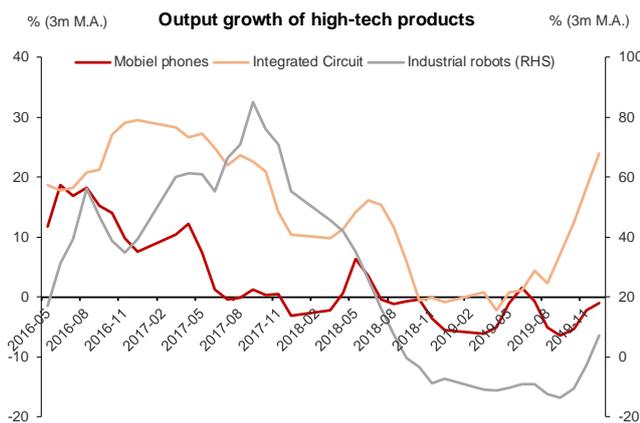
As discussed above, new infrastructure projects are likely to bring higher multiplier effect, i.e. to drive developments of other sectors of the economy directly or indirectly. Besides this general conclusion, we believe the following attributes also distinguish new infrastructure initiatives from previous ones.

1) Boost consumption as well as investment

Traditional infrastructure, transport facilities for example, boost FAI investment directly and instantly. Then as places are connected closer and more conveniently, population and industries begin to live and locate thereby drive economic activities. However, the entire transmission from infrastructure FAI to industrial output and consumption demand could take many years.

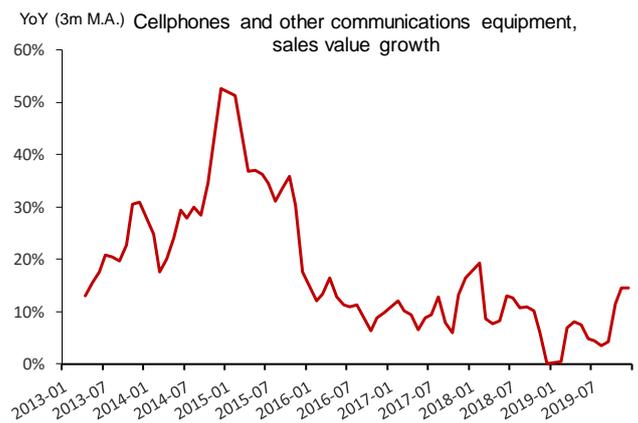
New infrastructure, especially technology-driven ones, however, could trigger consumption expenditures as well as output growth in a speedier way. We can observe that 5G, industrial internet, data centers have already boosted output of related products and downstream retail sales dramatically since 2H19 (see Figure 10 and 11).

Figure 10: Technology infrastructure has driven output growth in the supply side,



Source: NBS, Wind, CMBIS

Figure 11: ... as well as sales value growth in the demand side



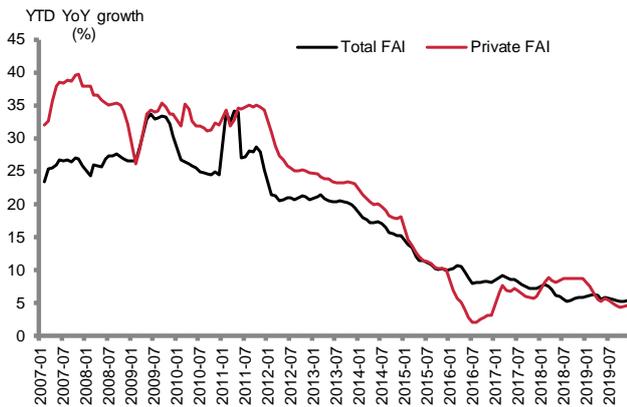
Source: NBS, Wind, CMBIS

2) Deeper participation of the private sector

Instead of government and SOEs playing decisive roles, new infrastructure projects (especially technology infrastructure projects) involve private players as well as governments and SOEs. Participation of the private sector has multiple implications for the economy.

- a) **The investment decision making process is more likely to follow a market-oriented procedure.** Rather than simply carrying out governments' executive orders, private-sector players tend to carefully ponder risk/return profile, financial feasibilities, leverage positions and etc.
- b) **With endorsement from governments, private-sector investment growth is likely to pick up.** In 2019, private FAI increased 4.7% YoY as opposed to overall FAI growth of 5.4%.

Figure 12: Private FAI



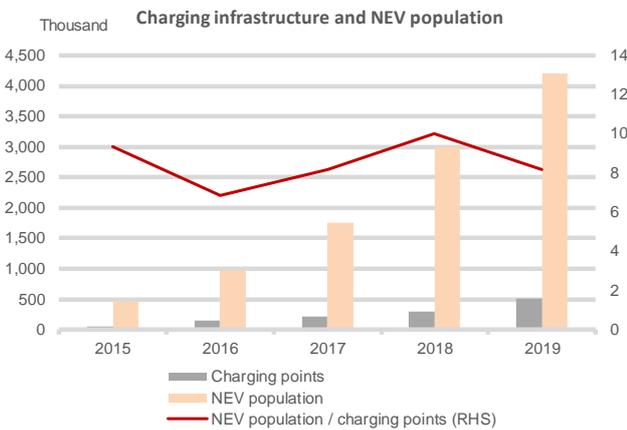
Source: NBS, Wind, CMBIS

3) Promote technology diffusion and adoption

We can look at the example of new energy vehicles (NEVs). NEV demand is driven by a myriad of factors ranging from the types and quality of NEV, customer awareness, affordability and the access to charging facilities. In fact, the lack of charging points remains a barrier to NEV adoption.

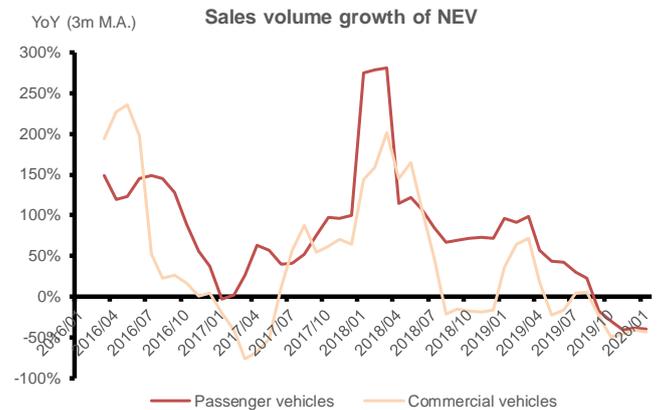
Therefore, the construction of publically available charging points is a necessary condition to push for NEV penetration. With 25% vehicles on road anticipated to be NEVs by 2025 (according to the MIIT), we need to provide more convenient charging facilities.

Figure 13: At YE2019, over 8 NEVs in China share 1 charging point



Source: Wind, CMBIS

Figure 14: NEV sales volume growth dipped with gradual phase-out of subsidies



Source: Wind, CMBIS

4) To give China a head start in the next wave of industrial revolution

It is well established that the next industrial revolution to dramatically lift productivity and efficiency will be characterized by digitization. Digital transformation of manufacturing, services and all value creation processes, incorporated with AI, IoT, blockchain, and etc. All count on a novel and reliable information infrastructure network. Getting 5G and data centers ready as soon as possible will give China a head start in the next wave of revolutionary development.

How large is the scale of new infrastructure investment?

Seminal once multiplier effect is considered

With respect to construction expenditure, we admit that technology new infrastructure, whether 5G or data centers, is dwarfed by traditional infrastructure projects. For example, construction FAI of 5G will accumulate to RMB 1.2tn by 2025, according to estimate from CAICT. If we turn to road construction, FAI in the single year of 2019 was RMB 2.16tn.

However, 5G is going to bring seminal multiplier effect via numerous “5G + X” initiatives in almost all scenarios we encounter in life. According to CAICT estimate, 5G is to trigger RMB 3.5tn investment along its supply chain, let alone investment in other remote industries triggered by 5G.

Evidence from key construction projects in Guangdong province

In order to gauge how big is the scale of new infrastructure investment, we turn to look at key construction projects of Guangdong province to gain some insights.

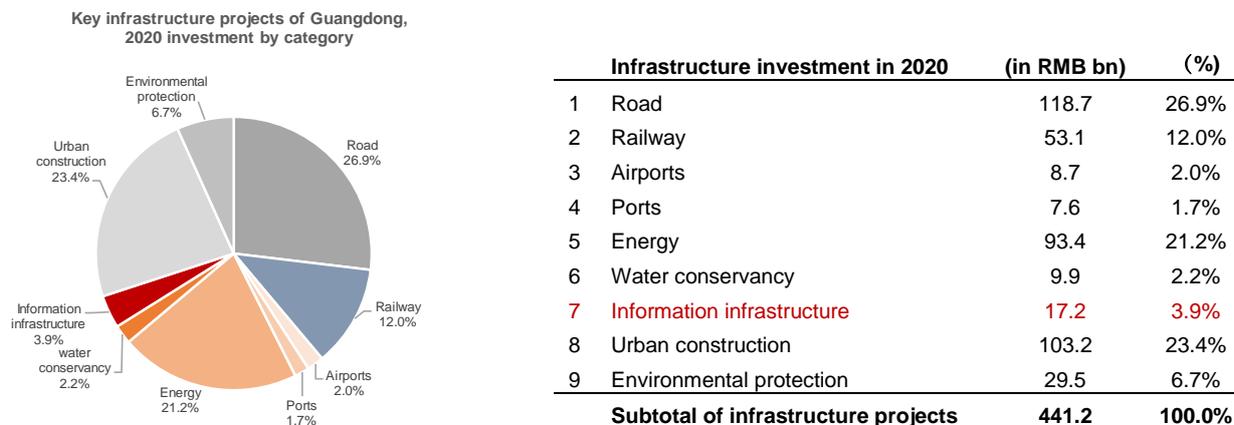
The Guangdong Provincial Development and Reform Commission (PDRC) outlined three categories of key construction projects (infrastructure 基础设施, industrial 产业工程, people’s livelihood 民生保障), with total investment amounting to RMB 5.9tn during the entire construction cycle. The province aims to invest RMB700bn this year in these key projects, among which RMB 441.2bn, or approximately 63%, is to be spent on infrastructure projects.

We then screened all key infrastructure construction projects in 2020. Figure 15 below exhibits the breakdown of RMB 441.2bn infrastructure investment by subcategory. According to the official categorization, 43% of or RMB 118bn investment is planned for transportation facilities (road, railway, airports and ports), 21% for energy projects, 23.4% for urban construction, 9% for environmental protection and water conservancy, and 3.9% or RMB 17.2bn is planned for information infrastructure.

39% of infrastructure investment will go to “new infrastructure. According to our broad definition discussed in previous paragraphs, we found that RMB 174.2bn, or 39% of total infrastructure investment in 2020 is planned for “new infrastructure” projects in Guangdong. These include,

- 1) IT infrastructure projects of RMB 17.2bn, among which RMB 14.8bn is designated for 5G base station construction, and the rest for data centers, and etc;
- 2) Intercity railway projects of RMB 10.9bn, connecting cities in the Greater Bay Area;
- 3) Offshore wind power projects of RMB 26.6bn, primarily in Yangjiang, Guangdong;
- 4) Electricity transmission projects of RMB 42bn, among which there’s a newly-launched project involving ultra-high voltage transmission and requiring RMB 40.1bn investment;
- 5) Urban rail transit of RMB 62.7bn.

New launched projects mainly involve new infrastructure. Among newly-launched projects, 87% investment is designated for new infrastructure and 42.7% of new infrastructure investment this year comes from newly-launched projects (vs. 19.3% for traditional infrastructure), while the rest from continued projects. It is fair to say that “new infrastructure” has opened up infrastructure investment in the beginning of the new decade.

Figure 15: Breakdown of key infrastructure projects in Guangdong

Source: Guangdong Provincial Development and Reform Commission, CMBIS

Figure 16: A rough calculation of “new infrastructure” investment

	2020 Investment	2020 Investment from newly-launched projects	
	(RMB bn)	(RMB bn)	% of overall inv.
IT infrastructure	17.2	16.3	94.8%
Among which: 5G base stations	14.8	14.8	100.0%
Intercity railway	10.9	1.7	15.1%
Offshore wind power	26.6	1.5	5.6%
Electricity transmission (incl. Ultra-high voltage)	42.0	40.1	95.5%
Urban rail transit	62.7	0.0	0.0%
Subtotal of new infrastructure	174.2	74.4	42.7%
Total infrastructure investment	441.2	85.1	19.3%

Source: Guangdong Provincial Development and Reform Commission, CMBIS estimates

Where does money come from?

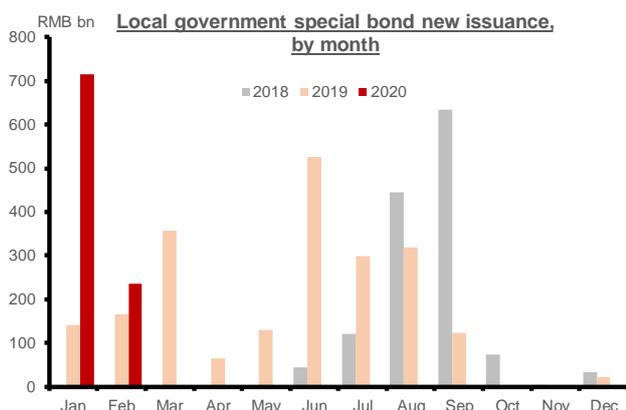
Funding environment for infrastructure projects is amiable. We believe to a larger share of new infrastructure projects are likely to turn to novel funding channels, such as local government special bond. Meanwhile, given that the private sector could play a more important role in new infrastructure construction and maintenance, we also observe an upward trend of PPP (Public-Private Partnership) project execution. Besides these, municipal bonds and banks loans are alternative choices of funding.

Local government special bond

In Jan-Feb of 2020, a total of RMB 949.8bn new local government special bonds (LGSB) were issued. We estimate new issuance amount is likely to reach RMB 3.35tn in 2020, compared to RMB 2.15tn in 2019. LGSBs have become a stable and novel source of funding for infrastructure projects.

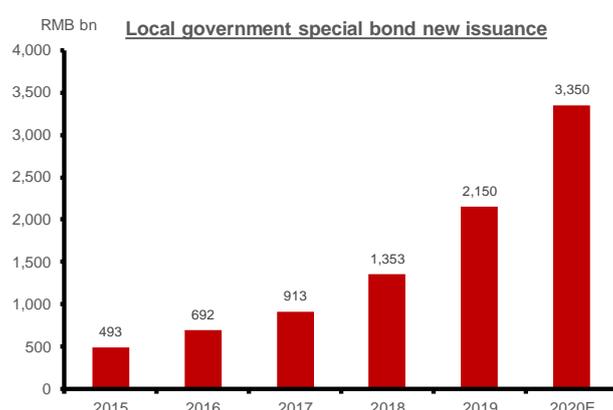
After a rough examination of project purposes, we estimate that at least 82% (~RMB 775bn) is planned for infrastructure projects whereas the rest will go to healthcare, education, social services, and other specified or unspecified public facilities. Around **25%** of the LGSBs planned for infrastructure will fund “new infrastructure” projects, ranging from urban rail transit, parking lots, cold-chain logistics, industrial parks, etc.

Figure 17: LGSB new issuance reached RMB 949.8bn in Jan-Feb 2020



Source: Ministry of Finance, CMBIS

Figure 18: We estimate a total of RMB 3.35tn issuance of new LGSB in 2020

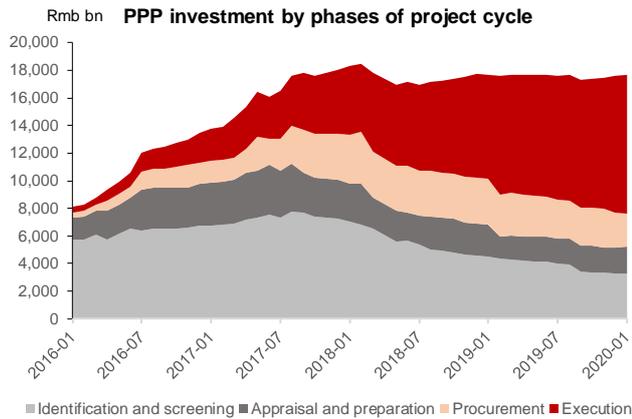


Source: Ministry of Finance, CMBIS

PPP projects

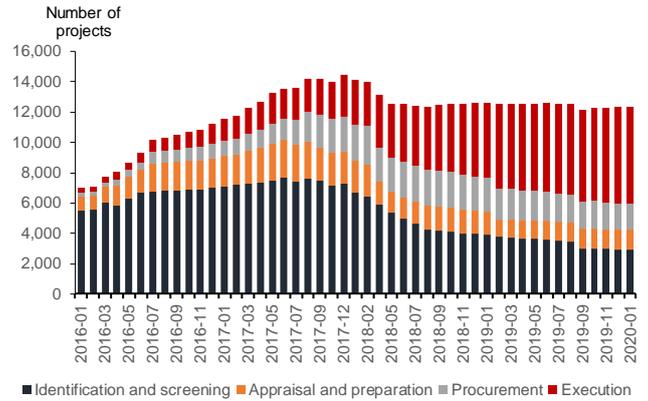
At the end of Jan 2020, total investment of PPP projects entering execution stage amounted to RMB 10tn, with 6,415 projects. We identified that roughly **24.4%** of the investment involved new infrastructure, such as urban rail transit, urban renovation, waste disposal, parking lots, charging points, etc.

Figure 19: Total investment of execution-stage PPP projects RMB 10tn by the end of Jan 2020



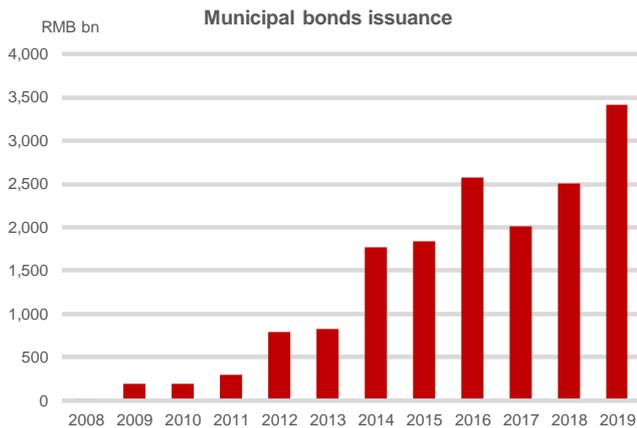
Source: NBS, Wind, CMBIS

Figure 20: There were 6,415 PPP projects in execution phase by the end of Jan 2020



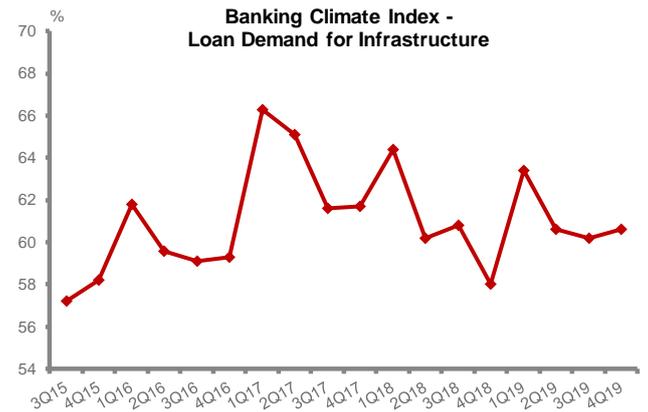
Source: NBS, Wind, CMBIS

Figure 21: Municipal bonds could be an alternative source of project funding



Source: Wind, CMBIS

Figure 22: Bank loan demand for infrastructure is edging up



Source: Wind, CMBIS

Spending spree?

There also exists doubts and concerns – is infrastructure construction excessive? Will there be a bubble?

Infrastructure investment is always long-term endeavor

Overall speaking, we do not think infrastructure investment is already excessive in China. Compared with developed countries, China's infrastructure facilities still need to improve in quantity, quality and efficiency. And as time evolves, we need new infrastructures.

Figure 23: China's Logistics Infrastructure Index ranked No.20 across the globe

Rank of Logistics Infrastructure Index*	2007	2010	2012	2014	2016	2018	Rank improvement (from 2007 to 2018)
Germany	3	1	1	1	1	1	2
Japan	6	5	9	7	11	2	4
Sweden	5	10	5	9	3	3	2
Netherlands	1	2	3	3	2	4	-3
Austria	8	21	11	25	12	5	3
Singapore	2	4	2	2	6	6	-4
United States	7	7	4	5	8	7	0
United Kingdom	10	16	15	6	5	8	2
Switzerland	4	6	13	11	7	9	-5
United Arab Emirates	18	17	17	21	13	10	8
Finland	17	8	6	28	16	11	6
France	15	14	14	13	15	12	3
New Zealand	22	26	29	22	29	13	9
Belgium	11	12	8	8	14	14	-3
Hong Kong SAR, China	9	13	7	14	10	15	-6
Australia	20	18	18	12	18	16	4
Denmark	14	15	10	17	24	17	-3
Italy	23	20	23	19	19	18	5
Spain	24	25	24	20	25	19	5
China	30	27	26	23	23	20	10

Source: World Bank, CMBIS

*The logistics infrastructure index is one of the subindices from Logistics Performance Index (LPI) of the World Bank, which measures the performance of infrastructure facilities most relevant for trade logistics.

How to avoid spending spree and inefficient investment?

1) Policy boost should not come at the cost of taking excessive risks

After the previous mass stimulus in 2008-09, China has spent years of painful destocking, deleveraging, cracking down on housing speculation, and shifting gear from “high-speed” to “high-quality” growth. We should not forget the lessons already learnt.

2) Encourage market participation

With the participation of more market players, we believe investment decisions are likely to be made in a more market-oriented way than they were before. Even with government endorsement, investment should be rested upon sound financial positions, healthy cash flow management, and should go through rigorous project approval.

Outlook for infrastructure investment

COVID-19 dragged construction progress

Severe interruptions were caused by COVID-19. Work resumption ratio of the construction industry is less than 60%, well below average of all industries. Only about 60% migrant workers have returned to the workplace. Recently, governments at all levels are making efforts to ensure that construction of key projects be resumed as soon as possible.

We estimate infrastructure FAI to maintain stable at 3.5-4.5% in 2020

We expect infrastructure investment to post YoY decline of 1-2% in 1Q due to COVID-19 and gradually pick up since 2Q when construction activities resume. Taking into account new drivers and all-rounded policy support, we forecast infrastructure FAI growth to maintain stable at 3.5-4.5% over the whole year (vs. 3.8% in 2019).

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